

STUDY ON CHINESE *MELANAPHIS* VAN DER GOOT (HOMOPTERA:
APHIDIDAE) WITH DESCRIPTIONS OF THREE NEW SPECIES

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Abstract.—The genus *Melanaphis* van der Goot 1917 includes 10 species in China. Three new species are described, *Melanaphis arthronophaga*, *M. grossisiphonellus*, and *M. zhanhuaensis*. *Melanaphis siphonella* is a new record for China. A key to the ten species is given.

Key Words: Aphididae, *Melanaphis*, new species, China

Melanaphis is a genus of Rhopalosiphina, Aphidinae, and it was described in 1917 by van der Goot. Twenty-one species of *Melanaphis* have been described. This genus is associated with Gramineae and Rosaceae, and only a few species have proven host alternation (Blackman and Eastop 1994). The species of this genus were reported from Europe (Barbagallo and Stroyan 1982, Stroyan 1984, Heie 1986), Africa, Australia, U.S.A., Uruguay, and Argentina (Blackman and Eastop 2000), and Asia. Sorin (1970) reviewed the Japanese species, Raychaudhuri and Banerjee (1974) reported the species in India, Pashchenko (1988) gave a key to the species of the former Soviet Far East, and Hodjat (1998) listed the species in Iran. Blackman and Eastop (1994, 2000) reviewed this genus on the world's crops and trees. The reports from China (Zhang and Zhong 1983; Tao 1990; Zhang et al. 1992, 1999) came from several provinces; thus, a review of this genus in China is needed.

MATERIALS AND METHODS

Structural terminology follows Zhang and Zhong (1983). The unit of measurement is in millimeters (mm).

The studied specimens are deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing.

RESULTS

Melanaphis van der Goot 1917

Melanaphis van der Goot 1917:61. Type species: *Aphis bambusae* Fullaway 1910.

Synonyms: *Longiunguis* van der Goot 1917, *Yezabura* Matsumura 1917, *Yezaphis* Matsumura 1917, *Geoktapia* Mordvilko 1921, *Pyraphis* Börner 1931, *Piraphis* Börner 1932, *Nevskia* Mordvilko 1932, *Masraphis* Soliman 1938, *Schizaphidiella* Hille Ris Lambers 1939 (Remaudière and Remaudière 1997).

Melanaphis differs from the other genera of Rhopalosiphina by the following characters: Siphunculus short, cylindrical or subcylindrical and alata frequently with dorsal sclerites or cross bars on abdominal tergites in front of the siphunculi. Seven species have been reported in China. In our study, we did not find *M. pyraria* (Passerini) in China. The specimens collected from *Pyrus* sp. and described by Zhang et al. (1999) as *M. pyraria* are not the same as Passerini's (1861) description, such as the sclerotic dorsal patch on the abdomen, the

length of the siphunculus, and the shape of the cauda. The appearance of the aphid differs remarkably on its secondary host plants according to the species and condition of the aphid grass colonized (Blackman and Eastop 2000), but there is no remarkable difference on the same host. Therefore, this species is not included in this paper. Three new species and one new record to China were found.

KEY TO CHINESE SPECIES OF *MELANAPHIS*

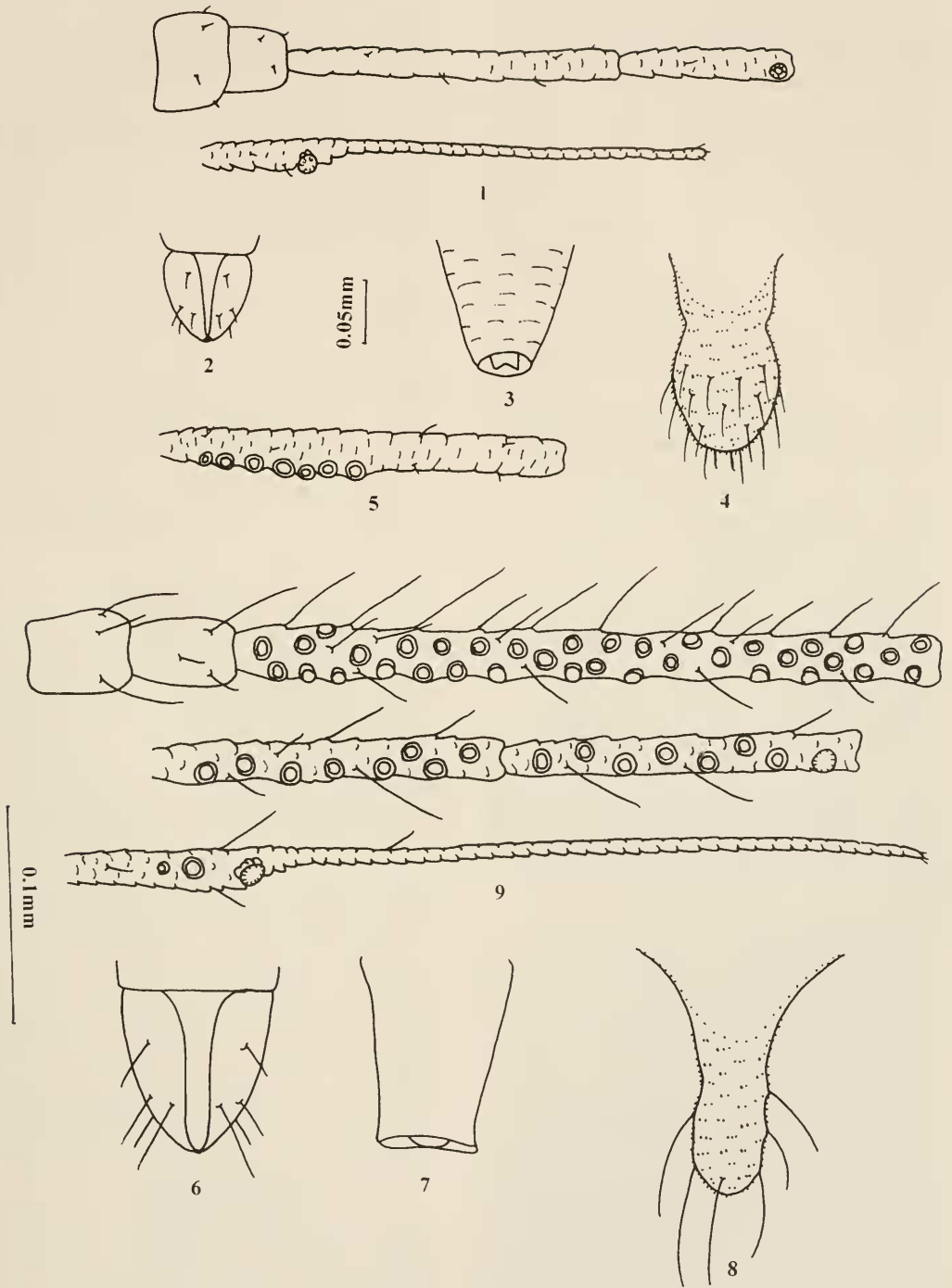
- 1. Dorsal cuticle with reticulation formed by rows of spinules *M. zhanhuaensis*, n. sp.
- Dorsal cuticle without reticulation formed by rows of spinules 2
- 2. Abdomen with 3-9 pairs of marginal hairs on segments I-III, their length 2.0 times as long as or longer than basal diameter of 3rd antennal segment 3
- Abdomen with 1-2 pairs of marginal hairs on segments I-III, their length at most 1.5 times as long as or longer than basal diameter of 3rd antennal segment 5
- 3. Genital plate with 2 hairs on its anterior part; abdomen with 5-6 dorsal hairs on segments I-III *M. grossisiphonellus*, n. sp.
- Genital plate with 5-10 hairs on its anterior part; abdomen with at least 15 dorsal hairs on segments I-III 4
- 4. Abdomen with 7-9 pairs of marginal hairs on anterior segments, with 20-38 dorsal hairs on segments I-III, cauda with 8-11 hairs *M. pyrisucta*
- Abdomen with 3-5 pairs of marginal hairs on anterior segments, with 15-22 dorsal hairs on segments I-III, cauda with 6 hairs *M. arundinariae*
- 5. Cauda with 4-6 hairs; siphunculus as long as or longer than cauda (with dark coxae) *M. bambusae*
- Cauda with at least 8 hairs; siphunculus shorter than cauda 6
- 6. Abdomen with 4-8 hairs on tergite VIII *M. graminisucta*
- Abdomen with 2 hairs on tergite VIII 7
- 7. Longest hairs on hind tibia as long as its middle diameter 8
- Longest hairs on hind tibia shorter than its middle diameter 9
- 8. Processus terminalis about 3.7 times as long as base of ultimate antennal segment; ultimate rostral segment shorter than 2nd hind tarsal segment; genital plate with 4 hairs on its anterior part *M. arthraxonophaga*, n. sp.
- Processus terminalis at most 2.5 times as long

- as base of ultimate antennal segment; ultimate rostral segment as long as 2nd hind tarsal segment; genital plate with at least 7 hairs on its anterior part *M. siphonella*
- 9. Dorsal hairs of head as long as or a little longer than basal diameter of 3rd antennal segment; ultimate rostral segment 0.8 times as long as 2nd hind tarsal segment; genital plate with 6-13 hairs on its anterior part *M. sacchari*
- Dorsal hairs of head about 0.5 times as long as basal diameter of 3rd antennal segment; ultimate rostral segment almost as long as 2nd hind tarsal segment; genital plate with 2-3 hairs on its anterior part *M. formosana*

***Melanaphis arthraxonophaga* Zhang, Qiao, and Zhang, new species**
(Figs. 1-5, 14)

Apterous viviparous female.—Body 1.088 in length, 0.675 in width. Antenna 0.925, segments I-V: 0.057, 0.051, 0.270, 0.137, 0.086 + 0.324. Ultimate rostral segment 0.062. Hind femur 0.283, hind tibia 0.484, 2nd hind tarsal segment 0.072. Siphunculus 0.103 in length, 0.118 in basal diameter, 0.046 in tip diameter. Cauda 0.157 in length.

Body elliptical. In cleared specimens, head, rostrum, antennal segments I-II and V, basal and apical parts of tibia, tarsi, siphunculi, cauda, anal plate and genital plate brown; other parts pale. Spiracles circular and open, spiracular plates elliptical, brown. Mesosternal furca without stem. Marginal tubercles on prothorax and abdominal tergites I and VII. Vertex slightly convex, antennal tubercles undeveloped. Antennal segments III-VI and 2nd tarsal segments transversely imbricate. Head with 1 pair of frontal hairs, 1 pair of lateral frontal hairs and 3 pairs of dorsal hairs. Two dorsal hairs on abdominal tergite VIII. Length of frontal hairs, marginal hairs on abdominal tergite I, and dorsal hairs on abdominal tergite VIII 0.60, 0.67 and 1.20 times as long as basal diameter of antennal segment III, respectively. Antenna 5-segmented, without secondary rhinaria. Processus terminalis 3.71 times as long as base of antennal segment V. Primary rhinaria round, ciliated. Rostrum reaching middle



Figs 1-9. 1-5, *Melanaphis arthroxonophaga*. 1-4, Apterous viviparous female. 1, Antenna. 2, Ultimate rostral segment. 3, Siphunculus. 4, Cauda. 5, Alate viviparous female, segment III of antenna. 6-9, *M. grossisiphonellus*. 6-8, Apterous viviparous female. 6, Ultimate rostral segment. 7, Siphunculus. 8, Cauda. 9, Alate viviparous female, antenna.

coxae; ultimate rostral segment short, in length 0.92 times as long as its basal diameter, 0.86 times as long as 2nd hind tarsal segment, with 1 pair of accessory hairs and 3 pairs of primary hairs. Hind femur 1.05 times as long as antennal segment III, hind tibia 0.44 times as long as body. Hairs on hind tibia 0.041, almost as long as the middle diameter of tibia. First tarsal segment chaetotaxy: 3, 3, 2. Siphunculus short, imbricated, without flange, 0.87 times as long as its basal diameter, 2.22 times as long as its tip diameter, 0.63 times as long as cauda. Cauda distinctly constricted in the middle, 1.66 times as long as its basal diameter, with 16–20 hairs. Anal plate broad, circular, with 21–24 hairs. Genital plate broadly egg-shaped, bearing 13 hairs, among them 4 hairs on its anterior part.

Alate viviparous female.—Body 1.238 in length, 0.642 in width. Antenna 5 or 6-segmented, 1.143 (or 1.051), 5-segmented, segments I–V: 0.072, 0.052, 0.371, 0.165, 0.103 + 0.381; 6-segmented, segments I–VI: 0.062, 0.052, 0.185, 0.155, 0.160, 0.093 + 0.345. Ultimate rostral segment 0.069. Hind femur 0.326, hind tibia 0.615, 2nd hind tarsal segment 0.076. Siphunculus 0.086 in length, 0.062 in basal diameter, 0.039 in tip diameter. Cauda 0.129 in length.

Body elliptical. In cleared specimens, head, rostrum, antenna, legs (except middle part of tibiae), and siphunculus dark brown; cauda, anal plate and genital plate brown; others pale. Spiracles circular and open, spiracular plates elliptical, brown. Abdomen with dark brown marginal sclerites on tergites I–VI, middle sclerites on tergites III–V, and cross bars on tergites VI–VIII. Two dorsal hairs on abdominal tergite VIII. Vertex flat and straight, antennal tubercles undeveloped. Head with 1 pair of frontal hairs, 1 pair of lateral frontal hairs and 4 pairs of dorsal hairs. Length of frontal hairs, marginal hairs on abdominal tergite I, and dorsal hairs on abdominal tergite VIII 0.67, 1.00 and 1.00 times as long as basal diameter of antennal segment III, respective-

ly. Antenna 5 or 6-segmented. Antennal segment III with 6–9 secondary rhinaria, which are round and convex. Processus terminalis about 3.75 times as long as base of ultimate antennal segment. Primary rhinaria round; ciliated. Rostrum reaching middle coxae; ultimate rostral segment short, as long as its basal diameter, 0.93 times as long as 2nd hind tarsal segment, with 1 pair of accessory hairs and 3 pairs of primary hairs. Hind tibia 0.50 times as long as body. Siphunculus short, imbricated, without flange, 1.42 times as long as its basal diameter, 0.68 times as long as cauda. Cauda distinctly constricted in middle, 1.32 times as long as its basal diameter, with 13 hairs. Anal plate bearing 19–21 hairs. Genital plate bearing 16 hairs, among them 5 hairs on its anterior part. Other characters as for apterous viviparous female.

Discussion.—This new species is closely related to *M. montana* Sorin, but differs from *M. montana* by the following characters: 1) Hairs on hind tibia almost as long as the middle diameter of the tibia [the latter (Sorin 1970): 2.00 times]; 2) dorsal hairs on abdominal tergite VIII 1.20 times as long as basal diameter of antennal segment III (the latter: 3.00 times); 3) cauda bearing 16–20 hairs (the latter: 10–11 hairs); and 4) abdomen without marginal tubercles on tergites II–IV (the latter: present).

Types.—Holotype: apterous viviparous female, No. Y2898-1-1.4, July 30, 1980, Liaoning Province (Tieling City, 123.8°E, 42.3°N), on *Arthraxon hispidus* (Thumb.), collected by Liu Lijuan. Paratypes: 1 apterous viviparous female, 3 alate viviparous females, No. Y2898, data same as holotype.

Melanaphis arundinariae
(Takahashi 1937)

Aphis arundinariae Takahashi 1937: 12.

Host plant.—*Sinarundinaria* sp.

Distribution in China.—Sichuan and Taiwan.

Melanaphis bambusae (Fullaway 1910)
Aphis bambusae Fullaway 1910: 35.

Synonyms: *Yezabura sasae* Matsumura 1917, *Yezabura sasicolla* Matsumura 1917, *Yezabura? photiniae* Matsumura 1918, *Masraphis phyllostachia* Soliman 1938 (Remaudière and Remaudière 1997).

Host plant.—*Bambusa* sp.

Distribution in China.—Hunan, Zhejiang, Sichuan, Yunnan, Guangdong and Taiwan.

Melanaphis formosana (Takahashi 1921)

Aphis formosana Takahashi 1921: 54.

Synonym: *Aphis miscanthi* Takahashi 1921 (Eastop and Hille Ris Lamberts 1976, Remaudière and Remaudière 1997).

Host plants.—*Echinochloa* sp., *Oryza* sp., and *Panicum* sp.,

Distribution in China.—Hebei and Taiwan.

Melanaphis graminisucta Zhang 1992

Melanaphis graminisucta Zhang 1992: 150.

Host plant.—Species of Gramineae.

Distribution in China.—Hunan.

***Melanaphis grossisiphonellus* Zhang,
Qiao, and Zhang, new species**

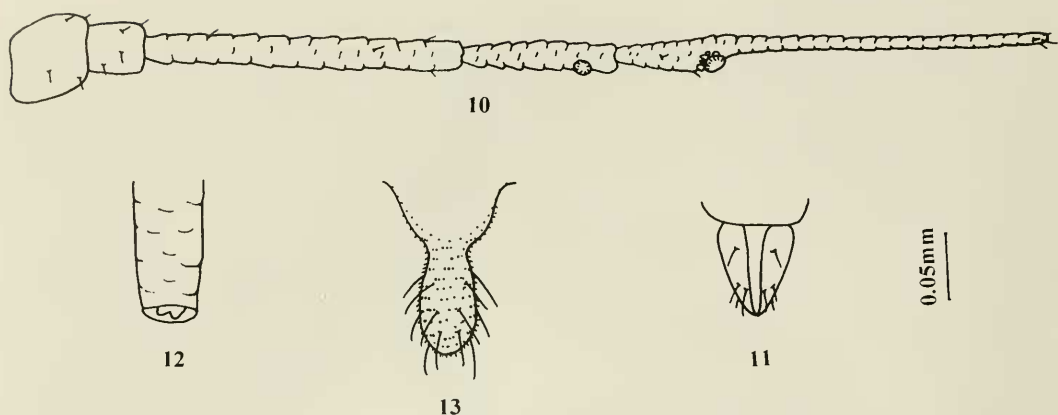
(Figs. 6–9, 15)

Apterous viviparous female.—Body 1.408 in length, 0.947 in width. Antenna 0.947, segments I–VI: 0.045, 0.049, 0.222, 0.129, 0.135, 0.093 + 0.274. Ultimate rostral segment 0.076. Hind femur 0.381, hind tibia 0.635, 2nd hind tarsal segment 0.083. Siphunculus 0.088 in length, 0.076 in basal diameter, 0.055 in tip diameter. Cauda 0.108 in length.

Body elliptical, dark green and with white wax. In cleared specimens, head dark, prothorax with a dark cross bar and a pair of marginal sclerites; mesothorax and metathorax with a pair of dark marginal sclerites, respectively; rostrum, legs (except the middle parts of tibiae), siphunculus, cauda, anal plate, and genital plate dark brown; antennal segments I–II and VI brown; others pale. Spiracles circular and open, spiracular plates elliptical, dark. Intersegmental mus-

cle sclerites light brown. Mesosternal furca brown, without stem. Marginal tubercles on prothorax and abdominal tergites 1 and VII, dark and very small, as large as hair-bearing tubercles. Vertex slight convex, antennal tubercles slightly developed. Head with 1 pair of frontal hairs, 1 pair of lateral frontal hairs, and 5 pairs of dorsal hairs. Prothorax with 3 pairs of dorsal hairs, 1 pair of marginal hairs. Abdomen with 5–6 dorsal hairs on tergites I–VII, 3 pairs of marginal hairs on tergites I–IV and VI–VII, 5–6 pairs of marginal hairs on tergite V, and 4–6 dorsal hairs on tergite VIII. Length of frontal hairs, marginal hairs on abdominal tergite I, and dorsal hairs on abdominal tergite VIII 2.94, 2.48 and 3.36 times as long as basal diameter of antennal segment III, respectively. Antenna 6-segmented, without secondary rhinaria. Processus terminalis 2.93 times as long as base of antennal segment VI. Primary rhinaria round, ciliated. Antenna slightly imbricated. Rostrum not reaching middle coxae; ultimate rostral segment short, as long as or a little longer than its basal diameter, 0.96 times as long as 2nd hind tarsal segment, with 1 pair of accessory hairs and 3 pairs of primary hairs. Hind femur 1.72 times as long as antennal segment III, hind tibia 0.45 times as long as body. Length of hairs on hind tibia 0.092, 2.30 times as long as middle diameter of tibia. First tarsal segment chaetotaxy: 3, 3, 2. Second tarsal segment transversely imbricated. Siphunculus short, smooth, with a small flange, 1.16 times as long as basal diameter, 1.60 times as long as its tip diameter, 0.82 times as long as cauda. Cauda 1.54 times as long as its basal diameter, with 5–6 hairs. Anal plate broad circular, with 14–17 hairs. Genital plate kidney-shaped, bearing 12–15 hairs, among them 2 hairs on its anterior part.

Alate viviparous female.—Body 1.408 in length, 0.640 in width. Antenna 1.132, segments I–VI: 0.049, 0.048, 0.323, 0.160, 0.161, 0.091 + 0.300. Ultimate rostral segment 0.080. Hind femur 0.389, hind tibia 0.720, 2nd hind tarsal segment 0.078. Si-



Figs. 10–13. *Melanaphis zhanhuanesis*, apterous viviparous female. 10, Antenna. 11, Ultimate rostral segment. 12, Siphunculus. 13, Cauda.

phunculus 0.099 in length, 0.071 in basal diameter, 0.046 in tip diameter. Cauda 0.097 in length.

Body elliptical, dark green and with white wax. In cleared specimens, head and thorax dark brown; antenna and legs brown; abdomen with dark brown cross bars on tergites III–VIII. Antenna 6-segmented, antennal segments III–VI with 23–40, 4–18, 6–12, 0–1 secondary rhinaria, respectively, which are round and convex. Processus terminalis about 3.32 times as long as base of ultimate antennal segment. Other characters as for apterous viviparous female.

Discussion.—This new species is closely related to *M. arundinariae*, but differs from it by the following characters: 1) Genital plate with 2 hairs on its anterior part (the latter: 7–8 hairs); 2) abdomen with 5–6 dorsal hairs on segments I–III (the latter: 15–22 hairs); and 3) alate viviparous female with 23–40, 4–18, 6–12, 0–1 convex secondary rhinaria on antennal segments III–VI, respectively (the latter: 12, 5, 0–2).

Types.—Holotype: apterous viviparous female, No. 7151-2-3-4, May 24, 1980, Yunnan Province (Lijiang, 2400m, 100.2°E, 26.8°N) on *Bambusa* sp., collected by Zhong Tiesen. Paratypes: 9 apterous viviparous females, 7 alate viviparous females, No. 7151, data same as holotype.

Melanaphis pyrisucta Zhang and Qiao 1999

Melanaphis pyrisucta Zhang and Qiao 1999, in Zhang et al. 1999: 589.

Host plant.—*Pyrus* sp.

Distribution in China.—Fujian.

Melanaphis sacchari (Zehntner 1897)

Aphis sacchari Zehntner 1897: 551.

Synonyms: *Aphis pheidolei* Theobald 1916, *Aphis sorghella* Schouteden 1906, *Aphis sorghi* Theobald 1904 (Eastop and Hille Ris Lambers 1976, Remaudière and Remaudière 1997).

Host plants.—*Echinochloa* sp., *Oryza* sp. and *Panicum* sp.

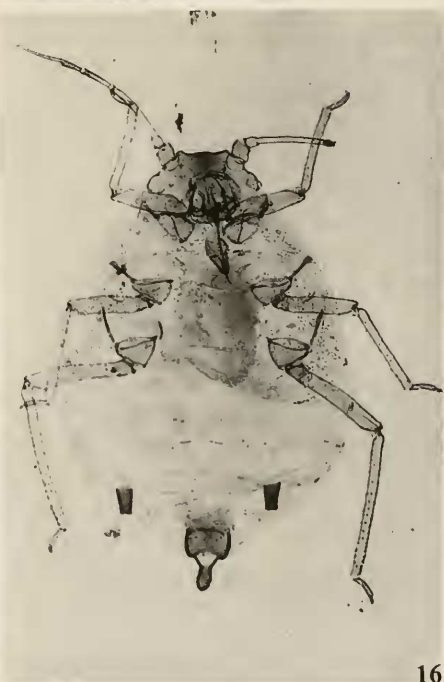
Distribution in China.—Heilongjiang, Jilin, Liaoning, Nei Mongol Auto. Reg., Hebei, Henan, Shandong, Shanxi, Anhui, Zhejiang, Jiangsu, Sichuan, Yunnan, Guangdong, Taiwan.

Melanaphis siphonella (Essig and Kuwana 1918)

Aphis siphonella Essig and Kuwana 1918: 73.

Host plant.—*Pyrus betulaefoli*.

Distribution in China.—Hebei (Beidaihe City). This is a new record for China.



Figs. 14–16. *Melanaphis* spp., habitus illustrations. 14, *M. arthraaxonophaga*. 15, *M. grossisiphonellus*. 16, *M. zhanhuanensis*.

Examined specimens.—1 apterous viviparous female, 2 alate viviparous females.

***Melanaphis zhanhuaensis* Zhang, Qiao, and Zhang, new species**
(Figs. 10–13, 16)

Apterous viviparous female.—Body 1.542 in length, 0.960 in width. Antenna 5 or 6-segmented, 0.781 (or 0.839), 5-segmented, segments I–V: 0.055, 0.042, 0.244,

0.113, 0.076+0.252; 6-segmented, segments I–VI: 0.055, 0.042, 0.155, 0.118, 0.118, 0.080+0.271. Ultimate rostral segment 0.078. Hind femur 0.336, hind tibia 0.546, 2nd hind tarsal segment 0.076. Siphunculus 0.092 in length, 0.052 in basal diameter, 0.042 in tip diameter. Cauda 0.128 in length.

Body elliptical and purplish red. In cleared specimens, cuticle on thorax and

abdomen with reticulation formed by rows of spinules; antennal segments IV–V (or VI), rostrum at apex, siphunculus, cauda, anal plate, and genital plate dark brown; legs brown; others pale. Spiracles circular and open, spiracular plates elliptical and brown. Mesosternal furca brown, without stem. Marginal tubercles on prothorax and abdominal tergites I and VII, with height a little longer than their basal diameter. Vertex slightly convex, antennal tubercles developed. Body with sparse, fine, short dorsal hairs. Head with 1 pair of frontal hairs, 1 pair of lateral frontal hairs, and 2–3 pairs of dorsal hairs. Prothorax with 3–4 pairs of dorsal hairs. Abdomen with 2 dorsal hairs on tergite VIII. Length of frontal hairs, marginal hairs on abdominal tergite I, and dorsal hairs on abdominal tergite VIII, 0.84, 0.64 and 1.29 times as long as basal diameter of antennal segment III, respectively. Antenna 5 or 6-segmented, without secondary rhinaria. Processus terminalis 3.22–3.32 times as long as base of ultimate antennal segment. Primary rhinaria round, ciliated. Antenna slightly imbricated. Hairs on segment III 0.008, 0.33 times as long as basal diameter. Rostrum reaching middle coxae; ultimate rostral segment short, 1.16 times as long as its basal diameter, 1.03 times as long as 2nd hind tarsal segment, with 1 pair of accessory hairs and 3 pairs of primary hairs. Hind tibia 0.35 times as long as body. Length of hairs on hind tibia 0.034, 0.94 times as long as middle diameter of tibia. First tarsal segment chaetotaxy: 3, 3, 2. Second tarsal segments transversely imbricated. Siphunculus short, slightly imbricated, with a flange, 1.76 times as long as its basal diameter, 2.20 times as long as its tip diameter, 0.72 times as long as cauda. Cauda 1.22 times as long as its basal diameter, with 12 hairs, constricted in middle. Anal plate broad, circular at apex, with 36 hairs. Genital plate bearing 21 hairs, among them 8 hairs on its anterior part.

Discussion.—This new species is closely related to *M. luzulella* and *M. pyraria* on

secondary host, but differs from *M. luzulella* by the following characters: 1) Siphunculus 0.72 time as long as cauda [the latter (Heie 1986): a little longer than cauda]; 2) cauda with 12 hairs (the latter: 5–7 hairs); and 3) abdomen pale in cleared specimens (the latter: with dark cross bar on tergite VIII, sometimes also with paler, shorter cross bars on tergites VI and VII). *Melanaphis zhanhuaensis* differs from *M. pyraria* on the secondary host by the following characters: 1) Siphunculi and cauda dark brown [the latter (Heie 1986): pale, whitish]; and 2) living on the subterranean part of the host (the latter: living above the ground).

Types.—Holotype: apterous viviparous female, No. Y2594-1-1-1, June 28, 1982, Shandong Province (Zhanhua County, 118.1°E, 37.3°N), on subterranean part of *Imperata cylindrica* var. *major* (Nees) C. E. Hubb., collected by Zhang Tingzhu. Paratype, 1 apterous viviparous female, No. Y2594, data same as holotype.

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